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ELECTRIC SMELTING OF IRON ORES FOR LESS DEVELOPED AREAS

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SUMMARY

ELECTRIC SMELTING OF IRON ORES FOR LESS DEVELOPED AREAS

by

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The present status of pig iron smelting in the conventional blast furnace is referred to. The average capacity for blast furnace units in operation today is 500-1000 t/d in Western Germany and USA. Blast furnace performance has been improved the last years by raw material preparation, particularly sintering of the ore.

Mechanically strong, lumpy metallurgical coke is required for blast furnace operation. In many countries and areas of the world coal suitable for production of metallurgical coke is not available. In some cases ores containing TiO_2 and low-grade siliceous ores which cannot be concentrated economically rules out the use of blast furnaces. Electric pig iron smelting has solved the problems of pig iron production from off-grade raw materials.

The electric pig iron process was developed for commercial use in the Scandinavian countries and is now installed or under adoption in 17 countries. A total furnace capacity of 775 MW is already in operation or being installed.

The modern electric furnace for pig iron furnace is designed for loads between 10 and 40 MW, supplied with three Söderberg self-baking electrodes and circular furnace pot. The charge is fed from over-head bins which automatically keep the furnace filled with charge by gravity feed system. Performance

data for the state-owned Norwegian plant in Mo i Rana are:

Furnace load	20 - 25 MW
Power consumption for pig iron with 1% Si	2000 kWh per metric ton of pig iron
Coke consumption	350 - 400 kgs
Electrode Paste	5 - 10 "
Down-time	2 - 5 %
Labour man-hours per ton	1.0 - 1.5

The large integrated iron and steel plant erected at Matanzas in Venezuela is equipped with nine ELKEM pig iron furnaces which are successively being started up in 1962.

Raw materials preparation by screening of ore, coke and fluxes and production of self-fluxing sinter have improved the electric pig iron furnace performance. However, a much more drastic reduction in power consumption and increase in productivity are achieved by preheating and prereduction of the ore. In the paper a description is given of several different methods developed on pilot plan scale the last years. The simplest approach is to preheat the complete charge in the charge bins above the electric furnace. By preheating an increase in production of 25 - 30% has been obtained. Preheating and some prereduction is established by shaft heating of ore/carbon pellets. The pilot tests indicate saving in electric power equivalent to 50% increase in production per kWh. The use of rotary kiln for preheating in connection with the ELKEM electric furnace has been used since 1958 in production of ferronickel in New Caledonia and will now be adopted also for pig iron smelting in new plants at Skopje in Jugoslavia and in Egypt.. Raw coal is a desired reducing agent for kiln prereduction. The coal is carbonized in the kiln and the volatiles liberated utilized for preheating and prereduction of the ore in the kiln. Kiln pretreatment will increase the production per kWh with 100% or more, depending on the raw material situation.

The great tolerance of the electric pig iron process with regard to iron ore and carbon makes this process particularly interesting for many of the less industrially developed areas throughout the world. Off-grade ores and coals may be utilized economically for iron and steel production.

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